4.0 HYDROLOGY

4.1 TOPOGRAPHY

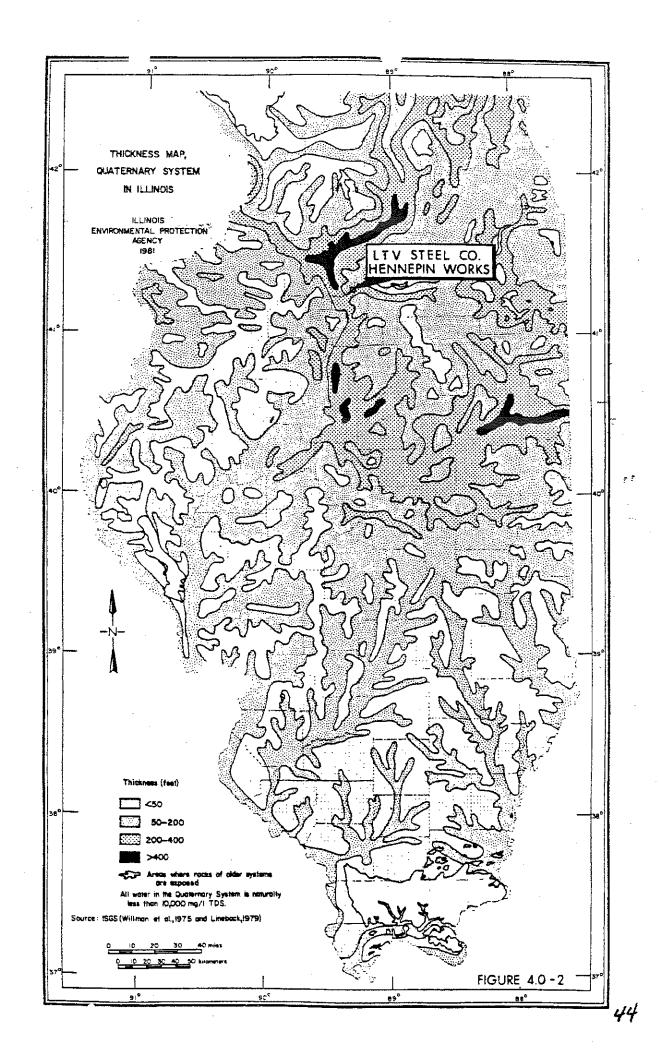
Hennepin Works is located in northern Putnam County, physiographically in the Bloomington Ridge Plain of the Central Lowland Province. The local topography is characteristic of Wisconsin glaciation and has been influenced by the dissection of the land surface by the nearby Illinois River. River drainage is primarily to the southwest, towards the Mississippi River. Locally, the elevation ranges from low areas at 450° above mean sea level to river terraces at 696° above mean sea level as illustrated in topographic map, Figure 4.0-1.

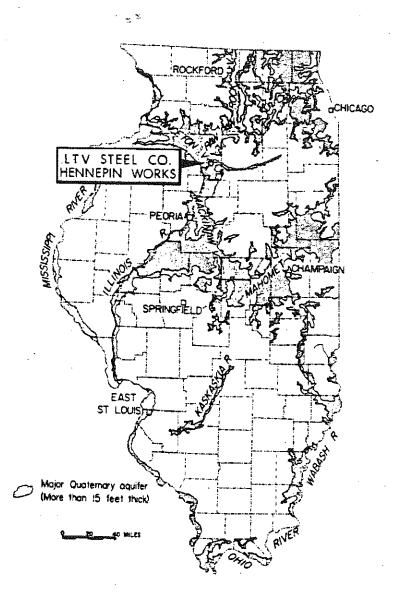
4.2 REGIONAL HYDROLOGY

The information utilized in describing the regional hydrology for the study area was obtained from the State of IEPA publication; "Aquifers of Illinois: Underground Sources of Drinking Water (USDW) and Non-Drinking Water", September, 1981 and Illinois State Water Survey Bulletin 60-18, "Public Groundwater Supplies in Putnam County", 1976.

The primary public water supply in Putnam County and vicinity is supplied by two major aquifer systems; the Quaternary and Pennsylvania aquifers. These aquifer systems are described in detail below:







Major Quaternary Aquifers in Illinois (modified from Bergstrom et al., 1968).

FIGURE 4.0-3

Devonian - Silurian Aquifers - The Devonian - Silurian limestone and dolomite sequences are not widely utilized as aquifers because they yield highly mineralized water in low to moderate quantities. The village of Hennepin obtains its ground water supply from limestone at depths up to 135'.

Ordovician Aquifers - Ordovician aquifers present within the study area consist in descending order of the Galena - Platterville Dolomite Groups, Glenwood - St. Peter Sandstone, Shakopee Dolomite, New Richmond Sandstone and Oreota Dolomite. Only a few water wells in Putnam County have penetrated into the Glenwood - St. Peter Sandstone which yields moderate quantities of mineralized water.

Underground Sources of Drinking Water (USDW) - A USDW is any aquifer which is potentially capable of yielding usable quantities of ground water (defined as having a TDS content less than 10,000 mg/L). Figure 4.0-4 illustrates the TDS content of ground water of aquifers in Illinois in cross section form. Figure 4.0-5 provides a description of the hydrogeologic role of all major aquifers in Illinois.



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"Aquifer: Incetton-Quidesville Fire to course-preimed analyticina, some dolornists assessors, Generally sixueds 100 feel in thickness. Presunt only in northern and control litimos. Beaut zons or most few only in the State, except in southern and southern parts. Est Claire Fm. 250-700 Confining Bed: East Claire Shales, sittstones, and stolernists and stolernists and stolernists and stolernists. Electrical States, and stolernists and stolernists and stolernists and stolernists and stolernists. Electrical States altestones, and stolernists and stolernists and stolernists and stolernists and stolernists. Electrical States altestones thick in Southern librors. | Fragrens Fr. 24-250 Propried ded conditional, shules and delorrists. Statewide. Maximum thickness assessed 700 ft. in southern litimos, Yavide moderate to email emounts of weter. Constitutes an USDW in wast-countral and northern half of the State. "Aquifer: Inortion-Quidesville Place to course-present andertona, some delerrists secretors. Generally succeds 100 feel in theichness. Present only in northern and control liminis. Basal zons in most feel only in the State, except in southern and positivestern parts. Esu Claire Fm. 250-700 Confining Bed: Eau Claire Shales, sittstones, and deletorists ameristones. Unclaring writing State. Emerch 1000 feet thick in Southern Hemost. | Francisis Fri. 24-50 Irentos St. Galerville St. 1-100 Galerville St. 1-100 Planton No. Planton No. 1-100 Planton No. | Francein. Fri. 53-250 Invarious St. Gaineville St. 5-100 Gaineville St. 5-100 Fine to coarse-grained analytics, across deleration sensitions. Gainevilly access to the State. Fine to coarse-grained analytics, across deleration across development thinois. Basal across in mattern had on the State. Fine to coarse-grained analytics, across deleration across deleration. Gainevilly access to the six in thickness. 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| Invited Sec. Invited Sec. Continues on USDW in west-control and solorwise. Statewise. Macureum thickness an USDW in west-control and northern half of the State. Invited Sec. Constituted an USDW in west-control and northern half of the State. | Irentos S. Galeeville St. Galeeville St. Justine St. Esta Claire Fm. 250-700 Esta Claire Fm. Zinhare St. Esta Claire Fm. Esta Claire F | Invator Sc. Invat | Invited St. Invited St. Invited St. Invited St. Galewrite St. Spinitry Spinitry St. Spinitry Spinitry St. Spinitry Spini | Invitos S. 6-160 Irvitos S. 6-160 Galeeville S. 5-100 Galeeville S. 5-100 Galeeville S. 5-100 Fine to coarse-preimed sendertons, some dolarmitic sendertons Galeeville Scale in decimans. Frament only in nerthern and central filmats. Basal zone is mat favorable water preimed sendertons and central filmats. Basal zone is mat favorable water preferring zone, Vision pre-question filmats. Basal zone is mat favorable water producing zone, Vision pre-questions of water to wells. Important LISOW in the State, except in doubtness and acutate filmats of water to wells. Important LISOW in the State, except in doubtness and delatoristic sendertons. Unclaring senting State. Except 1000 feet thick in Southern filmous. | Institute St. Institute St. Institute St. Galeville St. Institute an USDW in wight careful and northern half of the Stets. Constitutes an USDW in wight-careful and northern half of the Stets. **Applies: Institute. Annual control file Stets. Fire to course-grained analyticina, some dolernitis sendstors. Generally secreted 100 field in their man. Present only in northern half of the Stets. Place on the state of the stets of the stets and control filends. Annual some in man favorable water producing gams. Yields large quantities of water to wells. Important USDW in the State, except in southern and southern and southern parts. **Confining Bed: East Claims Limited Dat Electrical. Electrical. Electrical. Electrical. | Invites S. Invites S. Galerville St. Galerville St. Disconnected the State of the State and State of the | Invited St. Invited St. Invited St. Galerville St. Invited St. Galerville St. Invited St. Invited St. Galerville St. Invited S | Invators S. Invat | Invator Sc. Invat | Invator Sc. Invat | Irentos S. Irentos S. Galerville St. Galerville St. Juneary St. Lineary St. L | Institute St. Institute St. Institute St. Galeville St. Institute an USDW in wight careful and northern half of the Stets. Constitutes an USDW in wight-careful and northern half of the Stets. **Applies: Institute. Annual control file Stets. Fire to course-grained analyticina, some dolernitis sendstors. Generally secreted 100 field in their man. Present only in northern half of the Stets. Place on the state of the stets of the stets and control filends. Annual some in man favorable water producing gams. Yields large quantities of water to wells. Important USDW in the State, except in southern and southern and southern parts. **Confining Bed: East Claims Limited Dat Electrical. Electrical. Electrical. Electrical. |
| Irenton So. Gaineville So. S-100 Fine to coarse-presented annietrona, some dolerwist sandstore. Generally exceeds 1 feet in thickness. Framest only in northern and quested litinois. Assaul some st on feverable water producing zone. Violate large quantities of water to walk. Import LSDW in the Same, except in adulture and positives are parts. East Claire Fin. 250-700 **Corrilating Bed: East Claire Shales, sittstones, absorbines, and absorbine; sandstones, Unclairing anyting St. Embass 1000 feet that in Southern Henots. | Irentos S. Galerville St. Galerville St. Galerville St. Fire to coerte-greined sandstona, some dolernist: senestona. Generally access 100 feet in thickness. Framest only in nerthern and united libinis. Basal some is made feet were producing zone. Yields appe quantities of water to walk. Importen ISDW in the State, except in southern and southernstein parts. Eau Claire Fm. 250-700 Continuing Bed: Eau Claire Shales, aitstones, and dolernist: sandstones. Underlies system State Execute 1000 feet thick in Southern filenas. | Irenton St. 6-160 Constitutes on USDW in wast-control and morthern half of the State. | Invator St. 6-160 Constitutes on USDW in wast-central and morthern half of the State. | Invites St. 6-160 Constitutes on USDW in wast-control and northern half of the State. | Irenton So. Galesville So. Galesville So. Justin No. Galesville So. Justin No. Place to course preimed annistrona, aome dolernitic sensistors. Gararelly succeeds 100 fiest in thickness. Present only in northern and central libraic. Askal some or most favorable water producing game, Yester in southern and southeastern parts. Est Claire Fin. Z50-700 Confining Bed: East Claire Shales, sittstores, indocrities, and stolernitic sensistors. Gararelly succeeds 100 fiest thick in Southern libraics. Await some or most favorable water producing game, Yester of water to wells. Important ISDW in the State, except in southern and southeastern parts. **Confining Bed: East Claire** Shales, sittstores, sholernites, and stolernitic sensistors. Linclaring sentences to the state of | Iruntos S. Galerville St. Galerville St. Justin St. Limitaria Dal Limitaria | Irentos So. Galerville So. Galerville So. Justin No. Est Claire Fm. Z50-700 Constitutes an USDW in whet-cantral and northern half of the State. "Aquifur: Irronton-Galesville Fire to course-preimed aenderona, aome dolernitic sendstore. Generally succeeds 100 feet in thickness. Present only in northern and central libraria. Basal game is most feet in thickness. Present in southern and pouthers serving while Irroporant USDW in the State, except in southern and poutherstern parts. "Confining Bed: East Claire Shales, sitestores, alcolornites, and dolernitic sendstores. Unclaring septing State. Exceeds 1000 feet thick in Southern library. | Irenton St. Gaineville St. Gaineville St. S-100 Fine to course-grained annietrons, nome determitic sensistors. Generally succeeds 100 fines in thickness. Present only in northern and central libraic. Basal some is sheet in thickness. Present only in northern and central libraic. Basal some is sheet in thickness. Present only in northern and central libraic. Basal some is sheet in thickness. Present only in northern and central libraic. Basal some is sheet in the State, except in southern and poutherstern parts. States of the State of the St | Irenton St. 6-160 Constitutes on USDW in wast-control and morthern half of the State. | Irenton St. 6-160 Constitutes on USDW in wast-control and morthern half of the State. | Tranton St. 6-150 Constitutes on USDW in wast-control and northern half of the State. | Irenton So. Galesville So. Galesville So. Justin No. Galesville So. Justin No. Place to course present anniety in northern and central limits. Bend Jone is that the State. Place to course present only in northern and central limits. Bend Jone is that the State. Reported water producing game, Yellow pare quantities of water to wells. Important LISOW in the State, except in southern and southeastern parts. Confining Bed: East Claire Shales, pitteranes, and statement limits. Bendstring anytime State. Emeads 1000 feet thick in Southern limits. |
| Invites St. 5-160 | Practice Section Practice Se | Continue St. C-150 | Content St. C-150 | Continue St. Galeville St. | Continues Section Continues Continue | Invites St. B-160 | Truston St. 5-160 | Continued Described Desc | Continue St. C-150 | Continue St. C-150 | Continues St. Continues | Continues S. Color |
| Fire to course-preimed sandstona, some determinic sendstona. Generally exceeds 1 feet in thickness. Present only in nerthern and central filminic. Basal some is in favorable water producing some. Yields large quantities of water to waks, import LSDW in the Sizts, except in southern and southeastern parts. | Fine to coanse-grained auretrons, some dolarnisis sandstone. Generally succeeds 100 feet in thickness. Present only in nerthern and epitted filmois. Basal some is must favorable water producing some Niells large quentities of water to walls. Important ISDN in the State, except in southern and southeastern parts. East Claire Fm. 250-700 Corrilating Bed: East Claire Shales, allistones, dolarnisis, and dolarnisis sundstones. Underlies entire State Excepts 1000 feet thick in Southern Illinois. | Galeville St. 5-100 Fine to course-preimed analytonia, some dolarmitic sensitions. Generally secrets 100 feet in thickness. Present only in northern and central litinois. 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| feet in thickness. Present only in nerthern and quoted Minois. Assat some is in feveraged water producing some. Violate large quantities of water to walk. Import LISOW in the Sains, awapt in southwastern parts. East Claire Fm. 250-706 **Corrlining Sed: East Claire Shales, sitistores, abdominis: sandabonisis: sandational, Underline serving States 1000 feet that in Southwastern Henois. Elimbare No. | First in thickness. Present only in nerthern and central filmois. Besti tore is cross fewered events producing zone. Yields large quantities of water to wells. Important USDW in the State, except in southern and southeastern parts. East Claire Fm. 250-700 **Confining Bed: East Claire Sheles. allistones, dolorrises, and dolorrist: sandstones, Underlies entire State Excepts 1000 feet thick in Southern Historis. Elmbare No. | free in trickiness. Present only in northern and auntirel libraic. Basal zons is must be average the water producing zons. Yields intro quantities of water to walls, Important LSDW in the State, except in southern and southerstern parts. **Corrlining Bed: East Claims Limbard Dat Shales, sittstones, abdomistic, and delamitic sandstones. Unclaring antire State. Exceeds 1000 feet thick in Southern Illenois. | feet in thickness. Present only in northern and austral litinois. Basal som is most fevened water producing som. Yields large quentities of water to wells, important LSDW in the State, except in southern and southeastern parts. **Corrlining Bad: East Claping Lookert Dat | free in trickiness. Present only in northern and control librais. Assal zone is most favorable were producing zone. Yields impe quantities of water to walls. Important LSDW in the State, except in courtiers and southerszern parts. **Corrlining Bed: Eas Claire Shales. sitestones. and delaunitie zondstones. Unclaring system State. Except 1000 feet thick in Southern Illenois. | President No. Presid | Presim No. Presim No. Presim No. Est Claire Fm. 250-700 Corrifining Bed: East Claire: and southers and southers are sent to wells. Important USDW in the State, except in southern and southers are southern and southers are southern and southers are southern and southern and southern are southern and southern are southern parts. **Corrifining Bed: East Claire: Shales aits southern Illinois.** Exercises 1500 feet thick in Southern Illinois. Elimber: No. | Presim No. Presim No. Presim No. End Claire Fin. 250-700 Corrilining Bed: East Claire in Southern and southeastern parts. **Corrilining Bed: East Claire Shall save street in Southeastern parts. **Corrilining Bed: East Claire East Claire Shalls sites and delicability savetytones. Unclairing system State. Exceeds 1000 feet thick in Southern Henore. | President No. Presid | free in trickiness. Present only in northern and auntirel libraic. Basal zons is must be average the water producing zons. Yields intro quantities of water to walls, Important LSDW in the State, except in southern and southerstern parts. **Corrlining Bed: East Claims Limbard Dat Shales, sittstones, abdomistic, and delamitic sandstones. Unclaring antire State. Exceeds 1000 feet thick in Southern Illenois. | free in trickiness. Present only in northern and auntirel libraic. Basal zons is must be average the water producing zons. Yields intro quantities of water to walls, Important LSDW in the State, except in southern and southerstern parts. **Corrlining Bed: East Claims Limbard Dat Shales, sittstones, abdomistic, and delamitic sandstones. Unclaring antire State. Exceeds 1000 feet thick in Southern Illenois. | Prestin Discharge Present only in northern and control Binois. Basal zone is most favorable week producing ann. Yields impe quantities of water to walls. Important LSDW in the State, except in doubtern and southerszern parts. **Corrilining Bed: East Claire* Shales, sittstones, and dislocation sandstones. Unclaring system State. Excepts 1000 feet thick in Southern Henois. | President No. Presid |
| Previous to veils. Import LISDW in the Sizes, except in courtment and southwastern parts. East Claire Fin. 250-706 Corrilating Bed: East Claire Shales, aitstones, abdomities and dolomitic manistrones, Unclairing arriting States. Exceeds 1000 feet thick in Southern Bleegis. | Fraction No. Essu Claire Fm. Essu Claire Fm. Essu Claire Fm. Essueds 1000 feet thick in Southern Illenois. Einhard the Einhard No. | Planting No. Eau Claire Fm. Eau Claire Fm. 250-700 Conflining Bed: Eau Claire Shales, sittstones, and delamitic sandstones. Underline antire State. Exceeds 1,000 feet thick in Southern Hierory. | Processor was producing zone Yields large quantities of water to wells, Important LSDW in the State, example in inouthern and southern and southern parts. East Claire Fin. 250-706 Corrificients Bed: East Claire Shales, sittstens, and delauntitic sandstones. Underline arrays State. Exceeds 1,000 feet thick in Southern illenois. | East Claire Fro. 259-700 East Claire Fro. 259-700 Corrilating Sed: East Claire Shales: sittemest thick in Southern Herous. Eindoor No. 259-700 Eindoor | President Note Inspection I | Present No. East Claims Fm. Extracted Data Shales, sitts contains, and delarinitie samples on the State Extracts 1000 feet thick in Southern Hanges. | President No. Establish Service Service producing game, Yields large quantities of weeks Important ISDW in the State, assept in southern and southeastern parts. Confining Bed: East Claim. Confining Bed: East Claim. Shales, situations, soldernises, and delaristic sandscones. Unclaims soften State. Exceeds 1000 feet thick in Southern Herost. | Processor was producing some Yields large quantities of weeks Important LSDW in the Sarts, except in southern and poutheastern parts. East Claire Fin. 250-706 Confining Bed: East Claire Shales, sitts pour and delegants and delegants and sections. Unclairing anyting State. Excepts 1,000 feet thick in Southern Herous. | Planting No. Eau Claire Fm. Eau Claire Fm. 250-700 Conflining Bed: Eau Claire Shales, sittstones, and delamitic sandstones. Underline antire State. Exceeds 1,000 feet thick in Southern Hierory. | Planting No. Eau Claire Fm. Eau Claire Fm. 250-700 Conflining Bed: Eau Claire Shales, sittstones, and delamitic sandstones. Underline antire State. Exceeds 1,000 feet thick in Southern Hierory. | Processor was producing zone. Yields large quantities of weeks. Important LSDW in the State, except in abustness and poutheastern parts. Eau Cleare Fin. Limited that Shales, sitts process and delaphitic sandstones. Unclaring anyting State. Excepts 1,000 feet thick in Southern Herous. | President Note Inspection I |
| Sheles, sittstanes, abdominis, sand dolominis, sandstones, Unclarities entire Sti | Sheles sitestones adolernises and deletritic sandstones Unclacine entire State Embare S. Embare S. | Shales, sittstones, and delaporities sandstrones. Unclaring anytire State. Exceeds 1000 feat thick in Southern Hanous. | Shelas, sitistines, and delamitic sandstones. Underline array State. Exceeds 1000 feat thick in Southern Illinois. | Shales, sittstones, and delaporities sandstrones. Unclarines anytime State. Execute 1000 feat thick in Southern Henous. | Shales, sitstones, stolomises, and delamitic sandstones. Underlies untire State Exceeds 1000 feet thick in Southern Henous. | Shales, sitstones, stolerises, and delaristic sandstones. Underline setting State. Exceeds 1500 lest thick in Southern Hange. | Shales, sitstones, stolomises, and delamitic sandstones. Underlies softing State. Exceeds 1000 feet thick in Southern Henous. | Shelas, sitstones, stolornises, and delarnitic sandstones. Unclaring seques State. Exceeds 1500 less thick in Southern Henous. | Shales, sittstones, and delaporities sandstrones. Unclaring anytire State. Exceeds 1000 feet thick in Southern Hanous. | Shales, sittstones, and delaporities sandstrones. Unclaring anytire State. Exceeds 1000 feet thick in Southern Hanous. | Shales, sittstones, stolograms, and stolograms amustones. Unclaring untire State. Exceeds 1500 feet thick in Southern Henous. | Shales, sitstones, stolomises, and delamitic sandstones. Underlies untire State Exceeds 1000 feet thick in Southern Henous. |
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| *Aquifac: Elminarat-Mt. Simon Alainly sandstone with zome interbedded shall. Underfee entire state, locally deposited over Par-Centural highs. Createst their rest, over 2500 feet, is in represent littless. Yalds' any autentities of water. Upper parts constitute on USD's recthern one-third of littless. | *Aquifier: Eleminaret-Mt. Signon *Aquifier: Eleminaret-Mt. Signon Mainly sandstone with some inserbedded shells. Underfies entire stats. locally no deposited on highs. Greenest thickness, over 2500 feet is in march seater filterior. Yields large questions of wells. Upper parts constitute en USDW in reacthern one-third of librors. FIGURE 4.0-5 | *Aquifac: Elembarat-Mt. Simon Atainly sandstone with some interbedded shale. Underfies entire state, locally not described over Pre-Cambrain highs. Greenest their rate, over 2500 feet, is miscribenested libron. Yields apps quentries of wester. Upper parts constitute an USDW in northern one-third of librons. FIGURE 4.0-5 | *Aquifie: Elmhurat-Mt. Simon Alainly sandstone with some interbedded shale. Underfies entire state, locally not described over Per-Centuran highs. Greezest their rass, over 2500 feet, is morth-season filtens. Yields app a questities of webs. Upper parts constitute an USDW in northern one-third of likense. FIGURE 4.0-5 | *Aquiffac: Elmhurat-Mt. Simon Alainly sandstone with some inserbedded shale. Underfine unice state, locally not deposited over Pre-Combrain highs. Greenst thickness, over 2500 feet, is in north-austent listness. Yelds large questifies of water. Upper parts constitute on USDW in north-and one-third of listness. | *Aquifec: Elmhura-N.H. Simon Mainly sandstone with some inserbedded shells. Underfine entire state, locally not deposited over Pre-Combinen highs. Greenest thickness, over 2500 feet is in north-seaten Highors. Yields large quentities of water. Upper parts constitute en USDW in north-entire one-third of Hanos. FIGURE 4.0-5 | *Aquifac: Elemburat-Mt. Simon Mainly sandstone with some inserbedded shells. Underfine entire state, locally not deposited over Pre-Combinen highs. Greenest thickness, over 2500 feet is in north-seaten Hisnos. Yields large quentime of water. Upper parts constitute en USDW in north-more one-third of Hisnos. | *Aquiffec: Eleminarat-Mt. Signon Alainly sandstone with some interbedded shale. Underfies entire state. locally not deposited one fra-Cambrain highs. Greenest theirness, over 2500 feet, is in morth-seaten filteness. Yelling any automatical elemin. Upper parts constitute en USDW in report and illenois. FIGURE 4.0-5 | *Aquifec: Elembrarat-Mt. Signon Alainly sandstone with some interbedded shall. Underfies entire state. locally not deposited over Pre-Cambran highs. Greenest theirness, over 2500 feet, is in morth-seaten Hignes. Yield langs questifies of wester. Upper parts constitute en USDW in reprihem one-third of illinois. FIGURE 4.0-5 | *Aquiffac: Elmhurat-Mt. Simon Alainly sandstone with some inserbedded shale. Underfine entire state, locally not deposited over Pre-Combinen highs. Greenest thickness, over 2500 feet, is in morth-asserted litterior. Yields large questifies of water. Upper parts constitute an USDW in north-and one-third of litterior. FIGURE 4.0-5 | Alainly sandstone with nome interbedded shale. Underfies entire state, locally not deposited over Pre-Cambrain highs. Greenst thekness, over 2500 feet, is in morth-eastern Illinois. Yields large questities of wester, Upper parts constitute en USDW in northern one-third of Illinois. FIGURE 4.0-5 | Rainly sandstone with some inserbedded shale. Underfies entire state, locally not deposited over Pre-Cembrain highs. Greenst theirness, over 2500 feet, is in north-eastern Illanois. Yields large quentries of wester, Upper parts constitute en USDW in reportern one-third of Illanois. FIGURE 4.0-5 | *Aquifec: Elmhura-N.H. Simon Mainly sandstone with some inserbedded shells. Underfine entire state, locally not deposited over Pre-Combinen highs. Greenest thickness, over 2500 feet is in north-seaten Highors. Yields large quentities of water. Upper parts constitute en USDW in north-entire one-third of Hanos. FIGURE 4.0-5 |
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| 7 | | | | | | | | | | | | |
| | | NA N | CAOUX | CAMBRI | CAMBRI | CAMBRI | CAMBRI | CAMBRI | CROIN | GROUN | GAMBRI | CAMBRI |
| KE KX | | B | G G G G G G G G G G G G G G G G G G G | CAMB | CAMB | CAMB | CAMB | CAMB | CAMB | CAMB | CAMB | CAMB |
| 10 X X X X X X X X X X X X X X X X X X X | | 13 5 12-2-2-3 | 1 & E | C V S | A D D D D D D D D D D D D D D D D D D D | A D D D D D D D D D D D D D D D D D D D | A S S S S S S S S S S S S S S S S S S S | Z S S S S S S S S S S S S S S S S S S S | S S S S S S S S S S S S S S S S S S S | A C C C C C C C C C C C C C C C C C C C | N S S S S S S S S S S S S S S S S S S S | C A R |
| I S I E I E I E I E I E I E I E I E I E | | 1 5 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 | 13.14.1 | | | | | | | | | |
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| | | | | N. Summer C. Made crafts | N. Summer C. Made (1986) | N. Summer C. Made and Mr. | N. Summer C. Management | N. Summer C. Made crafts | Manual Comments (Manual Comments) | 1 M. Summer Co. (Man. WAN) | 1 M. Summer Co. Made . "Made" | Man. was |

(STUDENT, 1981)

[&]quot;Description of hydrogeologic role is applicable ever entire State

4.3 LOCAL HYDROLOGY

There are no active water wells within the Hennepin plant site nor within 1/4 mile of the injection well. The Hennepin Pubic Water District (HPWD) currently services the Hennepin Works. Unconsolidated sand and gravel deposited within the Illinois River Valley and the ancestral Mississippi Valley form the aquifer system supplying ground water to the HPWD. These sand and gravel deposits yield large quantities of water. Three water wells are presently in active use by the HPWD. Total municipal pumpage in HPWD as of October 1984 was 144,500 gallons per day (gpd).

A water well investigation was performed and a file search conducted at both the State of Illinois Geological Survey and Illinois State Water Survey. Six water wells are in active use by tenant farmers occupying property owned by J & L Steel, adjacent to the Hennepin Works plant site. In addition, 17 other water wells were located within the area of review. All are greater than 1/4 mile from the injection well and of the total of 23 wells described, only nine are in use. Pertinent well information is listed in Table 4.0-1 and a water well inventory with additional information is included as Appendix 4.0-A. Available information indicates that these wells are all less than 300' in depth. Figure 4.0-1 depicts water well locations with respect to Hennepin's waste disposal well.



TABLE 4.0-1 WATER WELL INVENTORY Hennepin Public Water District

| ** 3 3 | • | | | Date | |
|-------------|----|----|-----|--------------------|-----------------|
| Well | | | | Completed | Status |
| <u>Name</u> | • | | 1 | <u>odnipi coca</u> | 00000 |
| HPWD 1 | | | | 1910 | Plugged |
| HPWD 2 | | | | 1951 | Plugged |
| HPWD 3 | | | | 1955 | ≇In Use |
| HPWD 4 | | _ | | 1959 | # In Use |
| HPWD 5 | | | | 1967 | ■In Use |
| Unknown | | | | 1 <i>9</i> 41 | Plugged |
| Peterson | | | | - . | **Active |
| Morine | | | | 1924 | **Active |
| Byczynski | | | | 1904 | **Active |
| Dore | | | | 1922 | Unknown |
| Hamm | | | | 1895 | **Active~ |
| Unknown | | | | _ | **Active |
| Unknown | | | | 1966 | **Active |
| 831 | | | | 1966 | Unknown |
| 808 | | | | 1966 | Unknown |
| Anderson | | | - | 1904 | Unkñown |
| Henning | | | | 1904 | Unknown |
| O'Conner | | | • . | 1928 | Unknown |
| Fassino | | | | 1925 | Unknown |
| Holmes | | | | 1978 | Unknown |
| Maulfair | | • | | 1975 | Unknown |
| Richard | | | | 1975 | Unknown |
| Bonges | | * | | 1909 | Unknown |
| Kaplan | | | | 1968 | Unknown |
| Skutt | Š. | ** | | 1966 | Unknown |
| Ripsch | • | | | 1977 | Unknown |
| Eaton | | | | 1968 | Unknown |
| | | | | | |



^{*}In use by the Hennepin Public Water District (HPWD).
**In active use by tenant farmers on J & L property adjacent to the Hennepin plant site.

4.4 STATIC WATER LEVEL AND PIEZOMETRIC (POTENTIOMETRIC SURFACE) MAP

The most recent static water level measurement was obtained from HPWD well No. 3 in 1969. The water level was reported at 59' below the ground surface with a surface elevation of 503'.

According to the Illinois State Water Survey (Communication, 1984) no piezometric maps have been generated for the Hennepin Works study area because of the historic sparcity of water level information. Due to a lack of localized recent water level information, it was not possible to develop a piezometric map for the UIC permit study area. A recent chemical analysis of ground water is included Appendix 4.0-A.



5.0 GEOLOGY

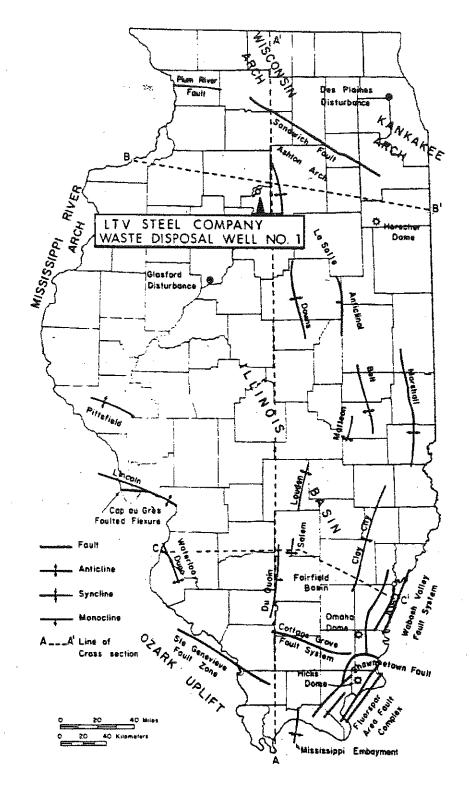
5.1 REGIONAL GEOLOGY AND TECTONICS

Putnam County is structurally located within a northwest - southeast trending depositional area known as the Illinois Basin. The Illinois basin contains dominately marine sedimentary sequences which range in thickness from 1500' to 15,000' from north to south.

The Illinois basin is a product of repeated tectonics over geologic time. The La Salle Anticlinal Belt is the dominant regional structure within the basin and has associated faults which cause varied relief. This structural lineament extends from La Salle County in north central Illinois, southeastward to Lawrence County near Vincennes, Indiana. The anticlines present within the belt are asymmetrical and possess a wide range in dip-locally up to 1000 feet/mile to the west and 100 feet/mile to the east. Other structural features include the Kankakee and Wisconsin Arches, several minor synclines, anticlines, domes and cryptoexplosion structures as illustrated in Figure 5.0-1.

Geological features closest to the study area are the Sandwich Fault and the Ashton Arch as seen in Figure 5.0-2. The Sandwich Fault Zone extends for 150 miles from south of Joliet to near Oregon. It is downthrown to the northeast with a maximum vertical displacement of more than 900° at its center according to McGinnis et al., 1976. Movement along this fault zone occurred after the Silurian and was most likely coincidental with movement along the La Salle Anticline in the Pennsylvanian and after.





Principal geologic structures of Illinois (modified from Willman et al., 1975).

FIGURE 5.0-1

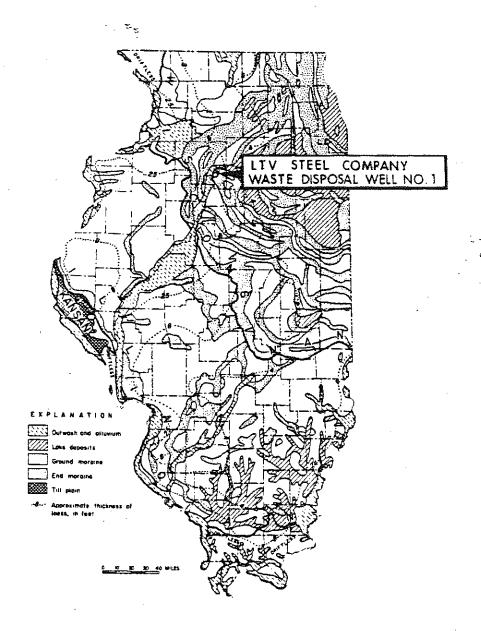
Local structural geologic features present are the Granville Basin, the Hennepin Syncline and the Depue and Cedar Point Anticlines.

5.2 LOCAL GEOLOGY - STRATIGRAPHY

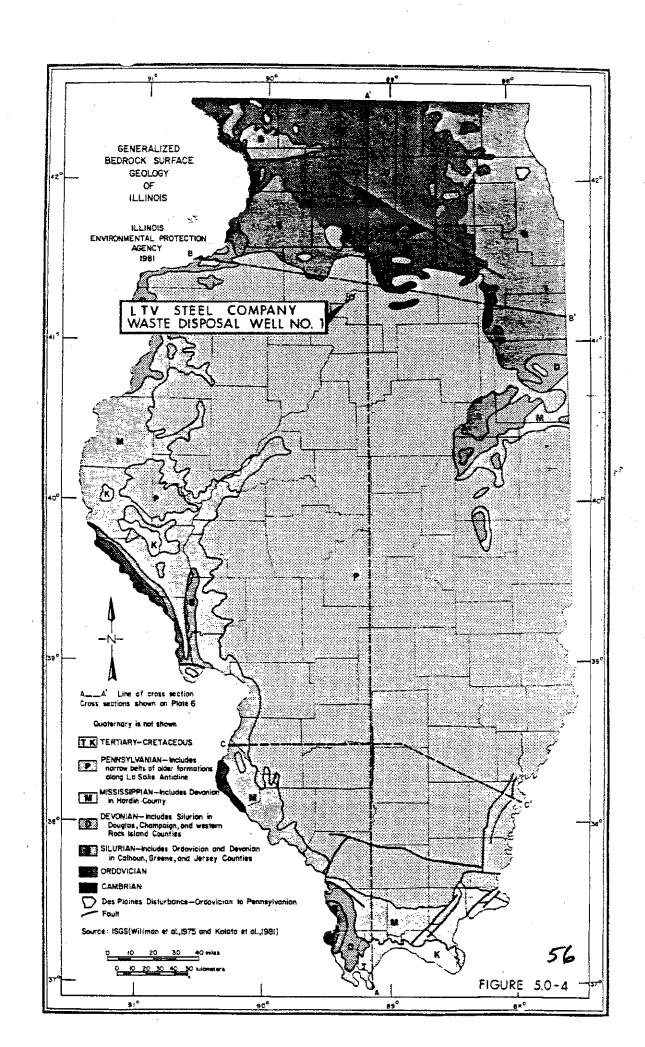
In the vicinity of Hennepin Works, the surficial geology consists of unconsolidated Quaternary glacial deposits and sections of Palezoic bedrock exposed by the dissection of the Illinois river. Glacial deposits and generalized bedrock surface are shown in Figures 5.0-3 and 5.0-4 respectively.

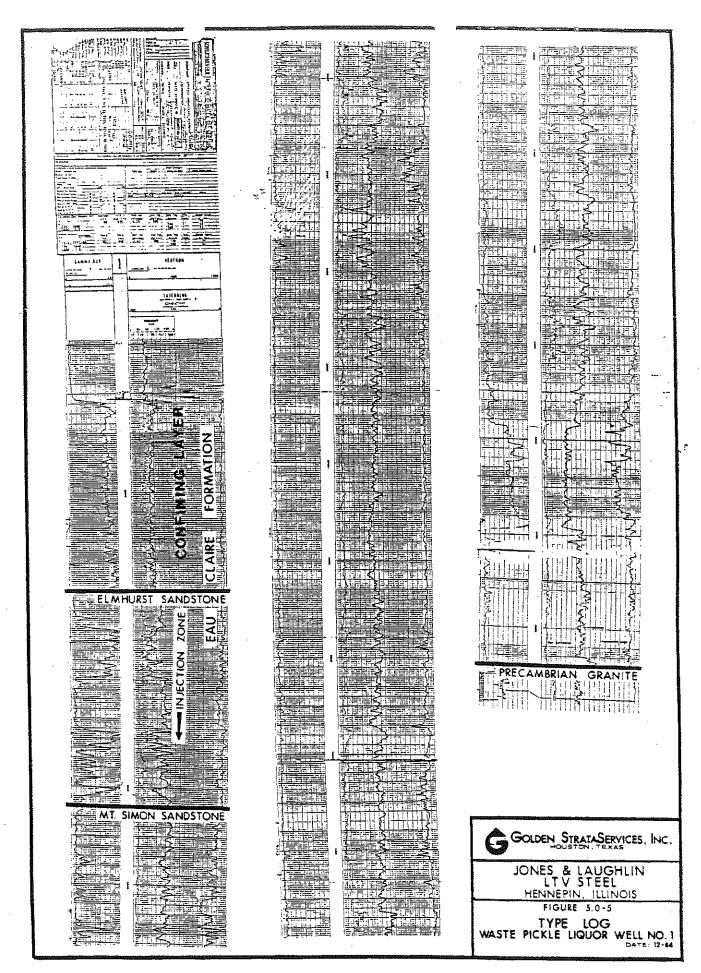
The subsurface geology at the plant site is described by using well log data and core analysis from Hennepin's waste disposal well No. 1 and information from the Handbook of Illinois Stratigraphy, (ISCS, 1975). A type log of the Eau Claire and Mt. Simon at the well's location is included as Figure 5.0-5 in addition to a generalized geologic column in Figure 5.0-6 to illustrate the stratigraphic relationships.

Precambrian Granite (4843'±) - The Precambrian Granite froms a non-conformable base upon which all sedimentary strata were deposited and is the oldest unit in the stratigraphic sequence.



Glacial geology of Illinois (after Bergstrom et al., 1968).
FIGURE 5.0-3





| SYSTEM | SERIES OR GROUP | FORMATION THICKNESS (FT.) | GRAPHIC LOG | ROCK TYPE (DRILLERS TERMS) | WATER-YIELDING CHARACTERISTICS; DRILLING AND WELL CONSTRUCTION DETAILS |
|--------------------|----------------------------------|-----------------------------------|------------------------|--|---|
| | Pleistocene | 0-500 항 | | Uncorsolidated glocal de- posts, allumum and wind-blown silf (arift, surface, overburden) | Water-yielding character variable. Large yields from thicker sand and growel deposits in bedrock valleys. Wells usually require screens and coreful development Chief agurler in area. |
| PENNSYL- VANIAN | McL sonsboro | 0-1000 | | Mainly shale with thin limestone, sondstone and | Water-yielding character variable. Cocally shallow sandstone and creviced limestone yield small |
| PEN | Corbondale Trodewater Caseyville | 0-150 0-600 | | coal beds (Goal Measures) | supplies. Water qualify usually becomes poorer with increasing depth. May require cosing |
| MISSISSIPPIAN | Chester | 0-500 | | Limestone, sundstone and shale | To deep to be considered as a source of groundwater in this area |
| 4 | | Ste Genevieve 0-120 | | Limestone | |
| ន | | St Lours - 0-270 | 7,77,7 | Limestone | May be water-yielding in Mason county where |
| S | Valmeyer | Soletin | | Shale | these formations are present at a shallow |
| <u> </u> | | Keokuk - C 300 | 7777 | | depth, in the rest of the great too deep to be considered as a source of groundwater |
| | | pyringion | 141 - 141 141 - 141 | Charly limestons | |
| DEVO- | Kinderhook | 0-200 | -=-=- | Shale | Not water-yellowa |
| NIAN | | 0-70 | | Limestone | Woter-yighting from crevices where encountered |
| SILU- | Niggoran | 0-350 | 17776 | Dalamite and limestone | at a shallow depth. In most of the orea too deep to be considered as a source of |
| RIAN | Alexandrion | 0-100 | | DODDING ONE WILLIAM | graundwater |
| | Cincinnation | Maqueketa 0-200 | 7-7-1 | Shale with timestone and | Not water-yielding of most places; casing required |
| | Mohawkich | Galena-Plattevilla 300-430 | | dosomite beds Limestone and dolomite | Not important as aquifers. Creviced dolonise probably yields same water to wells drilled into underlying sandstone. |
| ORDOVICIAN | Chazy | Glenwood - St. Pater 150 - 300 | | Sandstone, clean, white, thin dolomite and shale at lop [St Peter] | Dependable source of groundwater in the north- em part of the orea. Water becomes highly mineralized with increasing depth |
| ORDOV | Proins | Shokapee 200 - 410 | | Cherty dolomite thin bads of sondstone | Not important as aquifer, Liners in lower St. Peter sandstone are commonly seated in upper part of Shakopee |
| | Du | New Richmond 0-175 | | Sandstone and dolomite | |
| | Chies . | Oneoto 300-500 | | Dolomite with some sondstone beds (Lower magnesian) | Not important as aquifers in this area |
| | Trempealeau 200-250 | | | Dalomite with some sandstone beds | Limestone and sandstone beds are water-yielding. |
| | 5t, Crosson | Francosia 100 - 200 | | Sandstone, shale and dolamite | Woter highly mineralized or brine in most of the area, in the northern port, quality of water unknown |
| | | Ironton - Galesville 125 - 215 | 7 | Sanastone, clean, white, thin dolumite bed at the top (Oresbach) | worth original |
| CAMBRIAN | | Eou Claire 350-500 | | Shale, dolomite and sand- stone | |
| 70 | | Mt Simon 1200 + | | Sandstone, with thin red shale beds | |
| | PRE - CA | MBRIAN | 1717 | Granite and other | Crystolline rocks extending to great depths |

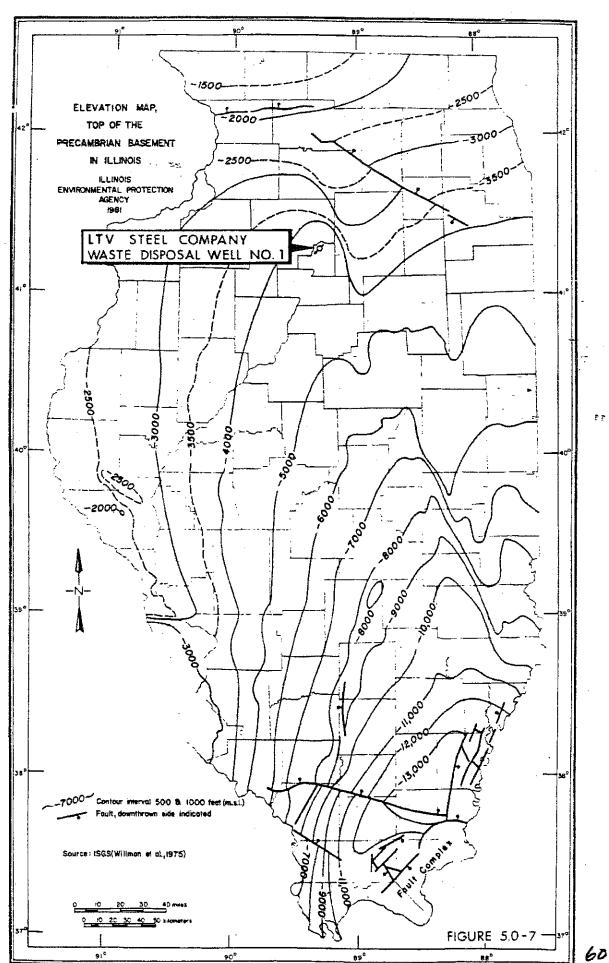
⁻ Generalized column of rock formations in east-central Illinois.

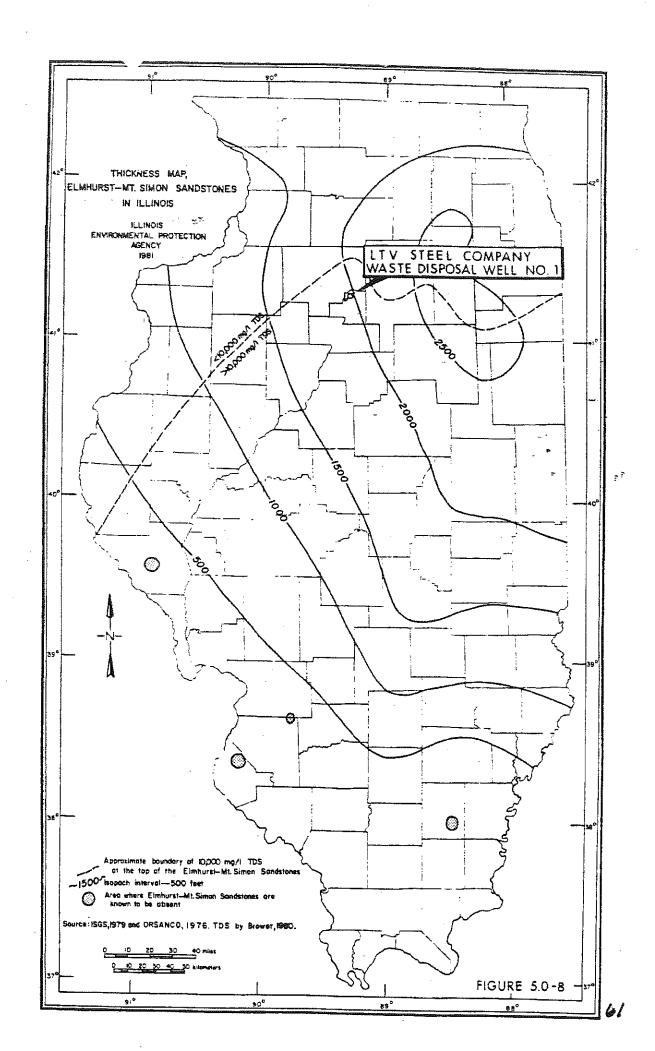
G

The general configuration of the Precambrian basement is illustrated in Figure 5.0-7. This structure contour map indicates that the basement is 2000' below the surface in northern Illinois to almost 14,000' in southern Illinois. Substantial local relief is present on the Precambrian surface (Atherton, 1971) and is evident as a controlling force in the subsequent deposition of the Mt. Simon Sandstone.

Cambrian Elmhurst - Mt. Simon Sandstone (2900'± - 4843'±), Thickness 1943' - The basal sedimentary sequence is the thick and extensive Mt. Simon Sandstone. The Mt. Simon Sandstone extends throughout Illinois and varies in thickness considerably from northeast to southwest. It ranges from 2500' thick in the northeastern portion of the state to less than 500' in the southwest as shown in thickness map, Figure 5.0-8. Several Precambrian highs are present which resulted in the nondeposition of the Mt. Simon in selected areas. The Mt. Simon is 1734' thick within the study area, does not outcrop and consists of fine to coarse grained, partly pebbley and friable sandstone.

Within the study area, the Elmhurst Sandstone, the lowermost member of the Eau Claire Formation is grouped with the Mt. Simon Sandstone because they are to considered hydraulically connected (Illinois Geological Survey, 1981). The Elmhurst Sandstone is fine to medium grained, fossil-iferous and contains interbedded gray shale.





A structure contour map depicting the top of the Elmhurst - Mt. Simon Sandstones is included as Figure 5.0-9. It also illustrates that the TDS level in the Elmhurst - Mt. Simon Sandstone aquifer is over 10,000 mg/L. Therefore both the Mt. Simon and Elmhurst sandstones are not considered USDWs within the study area where they are used as a waste disposal reservoir.

Cambrian Eau Claire Formation (2705'± - 2900'±) Thickness 195' - The Eau Claire Formation consists of shale, dolomite, shaley dolomite and sandstone. A basal sandstone member, the Elmhurst Sandstone, is grouped with the Mt. Simon Sandstone. The remainder of the Eau Claire Formation acts as an upper confining layer for the Elmhurst - Mt. Simon Sandstones. The thickness of the Eau Claire (including the Elmhurst Sandstone) varies from 300' to 1000'.

Cambrian Ironton - Galesville Sandstone (2535'± - 2705'±), Thickness

170' - The Galesville Sandstone consists of 40' - 100' of fine grained,

moderately well sorted and friable sandstone. The Ironton ranges from

50' - 100' and is a relatively coarse grained sandstone. These sandstone

units underlie all of the northern Illinois but are absent to the

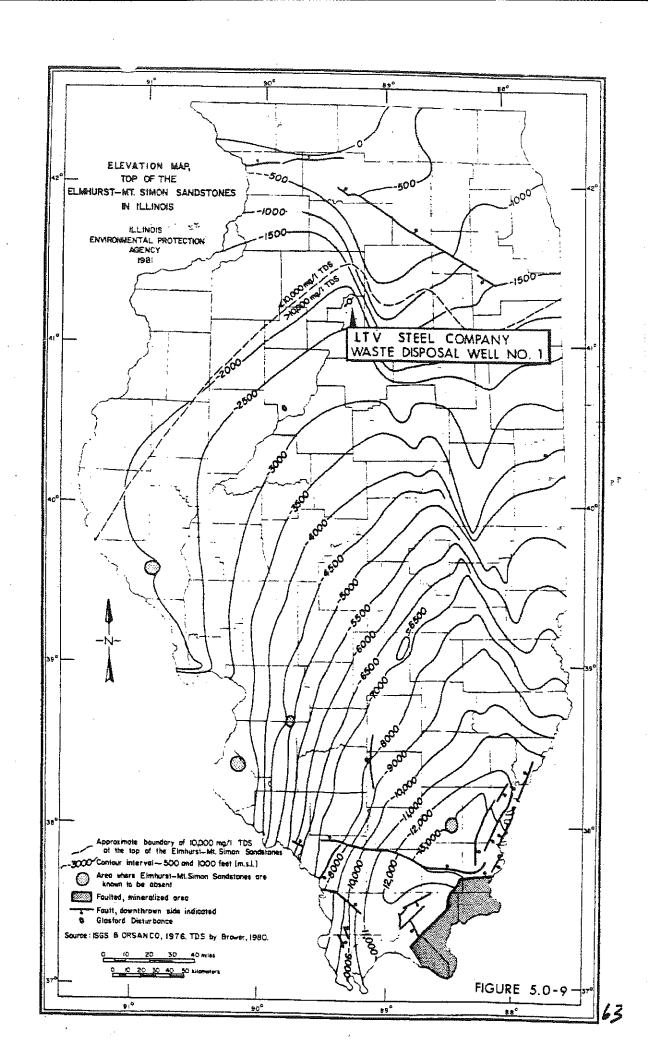
south. These units are utilized as Public Water Supply when the TDS

content is acceptable. At the Hennepin Works, the TDS content of these

units exceeds 10,000 mg/L and therefore these sandstones are not

considered to be USDWs.





Cambrian Franconia Formation (2380'± - 2535'±), Thickness 155' - The Franconia Formation consists of glaconitic, argillaceous sandstone and dolomite. South of the Sandwich Fault Zone, the Franconia becomes increasingly shaley and the uppermost portion grades to silty and sandy dolomite. The Franconia has limited utilization as an USDW in west central and northern half of Illinois.

Cambrian Eminence - Potosi Dolomites (2127'+ - 2380'+), Thickness

253' - The basal Potosi Dolomite consists of finely crystalline, pure
to slightly argillaceous dolomite. The overlying Eminence dolomite is—
sandy fine to medium grained dolomite with oclitic chert and interbedded
sandstone. These dolomites are used for underground injection in the
southern portion of Illinois. At Hennepin Works, these units are
considered to be USDW's.

Ordovician Prairie du Chien Group (1592'± - 2127'±), Thickness 535' - The Prairie du Chien Group consists of cherty dolomite and interbedded sandstone. The group contains four formations; in descending order, the Shakopee Dolomite, New Richmond Sandstone, Oneota Dolomite and the Gunter Sandstone. This group is considered as USDW within the area of review.

Ordovician Glenwood - St. Peter (Ancell Group) Formations (1474'± - 1592'±), Thickness 118' - The Ancell Group includes the St. Peter Sandstone and the Glenwood Formation. The St. Peter Sandstone consists of fine to medium, well sorted and rounded, frosted quartz sand that is



weakly cemented. The overlying Glenwood Formation is composed of poorly sorted sandstone, impure dolomite and shale. The Ancell Group is an USDW within the vicinity of the Hennepin Works site.

Ordovician Galena - Platteville Group (1108'± - 1474'±), Thickness 366' - The Platteville Group includes dominately limestone formations which overlie the Glenwood formation and underlie the Galena Group. It is subdivided into the basal Pecatonica Formation, a vuggy dolomite and the Platten Subgroup, a dominately fine grained lithographic limestone.

The Galena Group (also known as the Trenton) consists of two subgroups - Decorah Subgroup (shale and limestone) and the Kimmswick Subgroup (limestone and dolomite). The Galena and Platteville Groups are considered to be USDW's within the study area.

Late Ordovician Maquoketa Shale Group (930'± - 1108'±), Thickness 178' - The Maquoketa Shale Group unconformably overlies the Galena - Platteville Group except in southwestern Illinois. The group includes a basal shale unit - the Scales Shale Formation, a middle member - the Fort Atkinson Limestone and an upper dolomitic shale - the Brainard Shale. It acts as a confining layer for underlying ground water and yields water only in northeastern Illinois.

Silurian - Devonian (Hunton Megagroup) (385'+ - 930'+), Thickness 545' - The Hunton Megagroup consists of the carbonate sedimentary sequences of Silurian and Devonian age that in Illinois stratigraphically are between the Late Ordovician Maquoketa Shale Group and the late Devonian. The Silurian system includes the Alexandrian, the Niagaran and the Cayugan Series. The Devonian sequences are absent in northern Illinois but where present are dominately siliceous limestone, dolomite and chert.

Pennsylvanian System (175'± - 385'±), Thickness 210' - The Pennsylvanian System overlies Mississippian strata in southern and central Illinois and older strata in northern Illinois. The upper surface of the Pennsylvanian System was eroded and modified by Pleistocene glaciation and Holocene streams.

This system contains varied lithologies such as sandstone, siltstone, shale, limestone, coal and clay. It is considered an USDW within the study area.

Quaternary Pleistocene Glacial Deposists (0'± - 175'±) - The Pleistocene deposits consist of unconsolidated sediments whose lithology varies from boulders to clay. Glacial deposits overlie almost all bedrock sequences in Illinois. Thickness of these deposits range from 1' - 600'. They are 175' thick at the Hennepin Works site. Aquifers within the Quaternary system are capable of providing high yields of good quality water as discussed previously in Section 4.0.

5.3 STRUCTURAL GEOLOGY

Hennepin Works is located on the northern edge of the elliptically shaped Illinois basinal area. The gentle regional structural dip (20' per mile) of the major consolidated sedimentary sequences is to the southeast. Within the area of review, there are several minor geologic structures which do not appear to have a significant effect on the Elmhurst - Mt. Simon Sandstones within the study area. Regional geologic features have been discussed in Section 5.1.

The Elmhurst - Mt. Simon Sandstones are generally flat lying with a shallow dip of 28' per mile to the southeast. These sandstones are areally extensive and not bound by faulting or folding locally which might pose a constraint to waste disposal operations. In addition, the Elmhurst - Mt. Simon Sandstones are confined above by the shale units present in the regionally extensive Eau Claire Formation. Impermeable Precambrian bedrock serves as a lower confining layer and acted as structural control during the deposition of the basal sedimentary units. The influence of Precambrian bedrock configuration within the basinal area during the deposition of the Mt. Simon Sandstones is clearly evident in the structural contour map shown in Figure 5.0-9.

The thickness of the Elmhurst - Mt. Simon Sandstone varies significantly from 500' to 2500' as seen in thickness map, Figure 5.0-8. These sandstones combined thickness is over 1900' at Hennepin Works well No. 1.

5.4 CROSS SECTIONS

Regional Cross Sections included as Figure 5.0-10, illustrate the stratigraphic relationships of the major geologic units. The location of cross
section lines are shown in Figure 5.0-4. Two cross sections are included to
depict the stratigraphic relationships of the injection zone with its
respective confining layers. The cross sections shown as Figures 5.0-11 and
5.0-12 illustrates that the Elmhurst - Mt. Simon Sandstone and their
respective confining layers are areally extensive, locally flat lying and are
not bound by geological constraints such as faulting or folding.

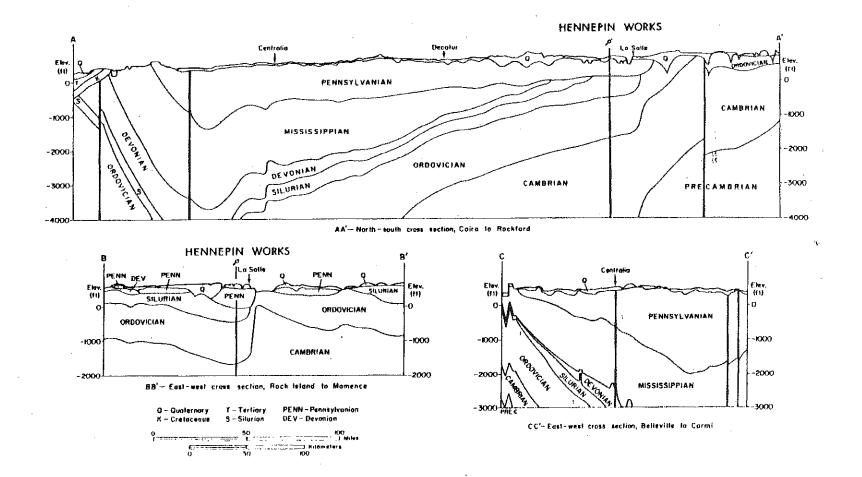
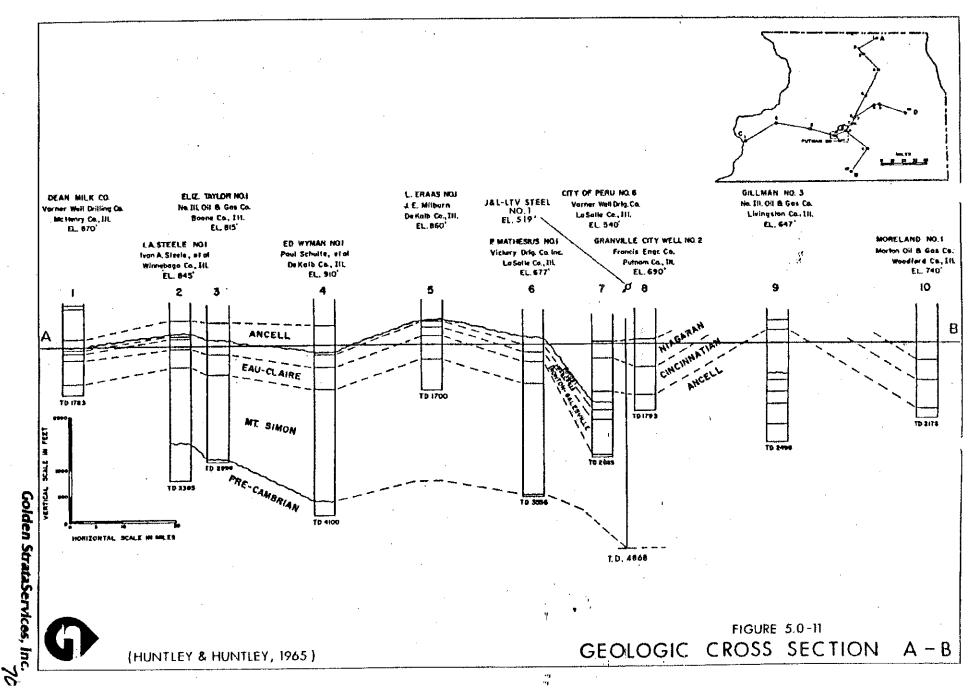




FIGURE 5.0 -110

REGIONAL GEOLOGIC CROSS SECTION



Golden StrataServices, In-

LTV Steel Company

HEUNEPIN WORKS

120 000 781 571

November 13, 1987

Illinois Environmental Protection Agency Division of Land Pollution Control - #24 Compliance Monitoring Section 2200 Churchill Road P.O. Box 19276 Springfield, Illinois 62794-9276

RE: Permit No. UIC-004-W1-JL

Enclosed is a "revised" copy of the September 1987 UIC Organic Scan Report for the Hennepin Works of LTV Steel Company. The original reported value for Herbicides was in error, as originally reported to us by our contract laboratory, because of failure to take into account the concentration factor for the calculation.

P.N. Schlingman, General Supervisor Operations Support Services

R.V. Norell, Asst./Superintendent

Maintenance & Operations Support Services

cc: L.A. Szuhay file

Illinois Environmental Protection Agency Division of Land Pollution Control Field Operations Section 4302 North Main Street Rockford, Illinois 61103

Illinois State Geological Survey Ground Water Section Attention: Mr. Ross Brower Natural Resources Building 615 East Peabody Drive Champaign, Illinois 61820

Illinois State Water Survey Ground Water Section Attention: Mr. Adrian Visocky 2204 Griffith Drive Champaign, Illinois 61820 RECEIVED

NOV 17 1987

IEPA/DIPC

LTV STEEL COMPANY HENNEPIN, ILLINOIS 61327 DEEP WELL INJECTION ANALYSES

"REVISION"

Permit Nos.: #UIC-004-W1-JL

IEPA #1558010006 Putnam County

USEPA #ILD000781591

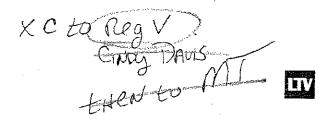
| Reportin WEEK | g Period <u>09/01/87 - 09/30/87</u> | 09/20 - 09/26 | |
|------------------|-------------------------------------|---------------------------------------|---------------------------------------|
| | solved Solids (mg/l) | 07/20 | |
| | ol Tron (/1) | · · · · · · · · · · · · · · · · · · · | |
| | Chrome (mg/l | | |
| | a i d | | |
| | (units) | | |
| | oride (mg/l) | | · · · · · · · · · · · · · · · · · · · |
| K Spe | c. Gravity | | |
| L Vis | cosity (SSU) | | |
| Y Sam | ple Temperature (°F) | | |
| Co1 | lect Temperature (°F) | | |
| Sul | fate (mg/l) | | |
| Nic | kel (mg/l) | | |
| Zin | c (mg/1) | | , |
| M Ars | enic (mg/l) | | |
| 0 <u>Cad</u> | mium (mg/1) | | |
| N Sil | ver (mg/1) | | |
| T Sel | enium (mg/l) | | |
| H Phe | nols (mg/l) | | |
| L Tot | al Organic Content (TOC) | | |
| Y Tot | al Organic Halogen (TOX)% | · | |
| Org | anic Scan: | | |
| Q <u>1</u> | . Volatiles (organic) | < 0.001 PPM | |
| R | . Acid | < 0.015 PPM | |
| T3 | . Base & Neutrals | < 0.03 PPM | |
| L 4 | . PCB's & Pesticides | < 0.08 PPB | |
| Y | . Herbicides | ← 0.003 PPM* | |
| | · | * REVISED 11/13/87 | - FACILIED |
| | | STONED Q 5 0 0 | RECEIVED |

UTIL2

IEPA/DLPC

LTV Steel Company

HENNEPIN WORKS



July 31, 1987

Harry A. Chappel, P.E., Acting Manager Facilities Compliance Unit Compliance Monitoring Section Illinois Environmental Protection Agency Division of Land Pollution Control 2200 Churchill Road Post Office Box 19276 Springfield, Illinois 62794-9276

Dear Mr. Chappel

Our response to your letter dated July 16, 1987, paragraphs No. 1 and 2 of attachment "A" have been made by our Mr. Lee E. Larson under separate copy.

In response to your paragraph No. 3, attachment "A" of the subject letter, efforts to reduce the volume and toxicity of spent pickle liquor generated at the subject facility include the following:

- o implementation of Integrated Process Control (IPC) techniques to identify and maintain optimum operating parameters in the interest of minimizing pickle liquor usage and maximizing product quality.
- o on-going evaluation of economically practicable methods of usage, storage and disposal of waste to minimize threat to human health and the environment.

Although LTV Steel's efforts may be nearing the lower limit of technical feasibility in terms of quantity/concentration of pickle liquor required - which directly influences the quantity/toxicity of spent pickle liquor generated - the efforts previously described have reduced the quantity of spent pickle liquor are shown in the following table:

| Year | Spent Pickle Liquor gal/ton* |
|------|---------------------------------|
| 1986 | 6.7 |
| 1985 | 7.2 |
| 1984 | 7.2 |

Further efforts in this area are expected.

RECEIVED

AUG - 3 1987

IEPA-DURG

In response to paragraph No. 4 of attachment "A" of the subject letter, I contacted your representative Mr. David S. Retzlaff and discussed with him what he believed to be an omission of our contingency plan submittal to the local agencies. Mr. Retzlaff apparently overlooked our record of this submittal during his inspection and I have mailed to him a copy of this submittal which was made back in 1980 and I believe that he now feels that this requirement is indeed satisfied.

If you have any further questions concerning these items, please call me at Area Code 815-925-2133.

P.N. Schlipgman, General Supervise

P.N. Schlingman, General Supervisor Utilities and Environment

/ch UTIL5

cc: L.A. Szuhay

R.A. Voytko

T.A. Zalenski

L.E. Larson

file

ITV Steel Company

November 11, 1986

Illinois Environmental Protection Agency Division of Water Pollution Control 2200 Churchill Road Springfield, Illinois 62706 Att: Compliance Assurance Section

RE: Permit No. IL0002631

Enclosed is the October 1986 Discharge Monitoring Report for the Hennepin Works of the LTV Steel Company.

P.N. Schlingman, General Supervisor Combustion and Utilities

W.C. Krapf, Superintendent Central Maintenance and Utilities

cc: L.A. Szuhay L. Wisniewski file

> Illinois Environmental Protection Agency Rockford Region Post Office Box 915 4302 North Main Rockford, Illinois 61105

NPDES Compliance Unit U.S. Environmental Protection Agency Region V 230 South Dearborn Street Chicago, Illinois 60604 cc: Deep Well Only

Illinois State Water Survey 2204 Griffith Drive Champaign, Illinois 61820

Illinois State Geological Survey Natural Resources Building 615 East Peabody Drive Champaign, Illinois 61820

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NOV 18 1986

MONTHLY INJECTION DATA

WELL: LTV Steel Company

Month October 1986

INJECTION

| | | GAL.W | | GAL.W | ATER | GAL.I | REAT. | PR | ESS | FL | WC | ANNULUS | PSIG |
|--------------|---------------------------------------|----------|---------------------------------------|-------|------|-------------|---|----------|---------|---|-------------|---------|------|
| DATE 10/1 | HOURS | MAX. | MIN. | MAX. | MIN. | MAX. | MIN. | | MIN. | MAX. | MIN. | MAX. | MIN. |
| 10/1 | · · · · · · · · · · · · · · · · · · · | | | | | | | 29 16 | 16 8 | | | 43 | 33 |
| 10/3 | | <u> </u> | | | | · | | | | | ····· | 33 | 23 |
| 10/4 | | | | | | | | 19 | 16 | • | | | 33 |
| | 10 42 | 212000 | 0 | 10000 | ^ | ara. | | 19 | 19 | | | 35 | 35 |
| 10/5 | 19.42 | 213900 | | 19280 | 0 | 953 | 0 | 95 | 0 | 255 | 103 | 248 | 35 |
| 10/6 | 3.25 | 0 | 0 | 0 | 0 | 4063 | 0 | 62 | 34 | · | | 73 | 45 |
| 10/7 | | | | | | | | 34 | 23 | | | 45 | 34 |
| 10/8 | | | · · · · · · · · · · · · · · · · · · · | | | | | 23 | 9 | | | 34 | 20 |
| 10/9 | | | · | ···· | | | | 23 | 19 | | | 33 | 33 |
| 10/10 | | | | | | | | 24 | 23 | | | 35 | 33 |
| 10/11 | | | | | | | | 24 | 24 | | | 37 | 35 |
| 10/12 | 15.25 | 144000 | 0 | 14800 | 0 | 6588 | 0 | 98 | 0 | 245 | 217 | 238 | 35 |
| 10/13 | | | | | | | ······································ | 37 | . 29 | | | 53 | 43 |
| 10/14 | | | | | | | | 29 | 9 | | | 43 | 23 |
| 10/15 | | ·· | | | | | | 17 | 9 | | | 32 | 23 |
| 10/16 | | - | | | | | | 19 | 17 | | | 33 | 32 |
| 10/17 | | | | | | | | 20 | 19 | | | 35 | 33 |
| 10/18 | | | | | | | | 20 | 20 | | | 33 | 28 |
| 10/19 | 20,43 | 182200 | 0 | 15345 | 0 | 6264 | 0 | 90 | 0 | 230 | 152 | 225 | 28 |
| 10/20 | | | | • | | | | 44 | 31 | | | 57 | 43 |
| 10/21 | | | | | | | | 31 | 15 | · _ · · · · · · · · · · · · · · · · · · | | 43 | 27 |
| 10/22 | | | | | | | | 18 | 8 | | | 30 | 23 |
| 10/23 | | | | | | | | 20 | 18 | ··· | | 33 | 30 |
| 10/24 | - | - | | | | | | 21 | 20 | | | 33 | 33 |
| 10/25 | | | | | | | | 22 | 21 | **** | | 35 | 33 |
| 10/26 | 17.08 | 172300 | 0 | 15538 | 0 | 5855 | 0 | 95 | 0 | 255 | 190 | 232 | 35 |
| 10/27 | | | | | | | | 41 | 30 | <u> </u> | 170 | 53 | |
| | | | | - | | | *************************************** | 41 | 20 | | | 23 | 43 |

MONTHLY INJECTION DATA

WELL: LTV Steel Company

Month October 1986

INJECTION

| | | GAL. | WASTE | GAL. | WATER | GAL. | TREAT. | PR | ESS | FLOW | ANNULUS | PSIG |
|-------|-------|------|-------|------|-------|------|--------|------|------|-----------|---------|------|
| DATE | HOURS | MAX. | MIN. | MAX. | MIN. | MAX. | MIN. | MAX. | MIN. | MAX. MIN. | MAX. | MIN. |
| 10/28 | | | | | | | | 29 | 7 | | 43 | 20 |
| 10/29 | | | | | | | | 17 | 7 | | 25 | 20 |
| 10/30 | | | | | | | | 19 | 17 | | 32 | 2.5 |
| 10/31 | ٠ | | | | | | | 20 | 19 | | 27 | 25 |

| MONTHLY AVE. | 178105 | 0 | 16261 | 0 | 5931 | 0_ |
|----------------|--------|----|---------|-----|-------|----|
| MONTHLY TOTAL | 712420 | | 65043 | | 23723 | |
| MONTHLY GRAND | TOTAL | | 801186 | | | |
| CUMULATIVE VOL | | 1. | 35,141, | 683 | | |

SIGNED Pr Schugman

| | | MONTHLY ' | |
|--------------------|--------|-----------|------|
| | Ave. | Max. | Min. |
| Inj. Press. PSI | 25 | 98 | 0 |
| Inj. Flow GPM | 206 | 255 | 103 |
| Annulus Press. PSI | 47 | 248 | 20 |
| Vol. (gal.) WASTE | 178105 | 213900 | 0 |
| Vol. (gal.) WATER | 16261 | 19280 | 0 |
| Vol. (gal.) TREAT. | 5931 | 6588 | 0 |

LTV STEEL COMPANY

(JONES AND LAUGHLIN STEEL CORPORATION)

HENNEPIN, ILLINOIS 61327

DEEP WELL INJECTION ANALYSES

Permit No.: 0002631

Discharge: 003

Reporting Period 10/01/86 - 10/31/86

| | 09/28 - | 10/05 - | 10/12 - | 10/19 - |
|-------------------------|---------|---------|---------|---------|
| WEEK | 10/04 | 10/11 | 10/18 | 10/25 |
| Dissolved Solids (mg/l) | 312,100 | 322,768 | 300,336 | 320,116 |
| Total Iron (mg/l) | 126,221 | 126,221 | 121,753 | 128,455 |
| Hex Chrome(mg/l | 0.08 | 0.05 | 0.08 | 0.16 |
| % Acid | 2.55 | 2.77 | 2.19 | 2.56 |
| pH (units | 0 | 0 | 0 | 0 |
| Chloride (mg/l) | 209,661 | 211,880 | 198,481 | 213,751 |
| Spec. Gravity | 1.2423 | 1.2405 | 1.2402 | 1.2420 |
| Viscosity (SSU | 160 | 171 | 163 | 165 |
| Sample Temperature | 73 | 74 | 75 | 64 |
| Collect Temperature | 98 | 94 | 85 | 85 |

REMARKS:

SIGNED Ph Schlugnan

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NOV 18 1986

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